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PATENT APPLICATION

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IN THE U.S. PATENT AND TRADEMARK OFFICE

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Applicants : Naohiro TOMITA et al
For : PRESSURE SENSOR, METHOD OF MANUFACTURING SAME
AND STRUCTURE FOR DETECTING CYLINDER INTERNAL
PRESSURE OF INTERNAL COMBUSTION ENGINE

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PRELIMINARY AMENDMENT CANCELING CLAIMS

Sir:

Prior to calculation of the filing fee in the above-
identified application, kindly enter the following:
(Please see following pages.)

Amendments to the Claims

This listing of claims will replace all prior listings of claims in the application.

Listing of Claims

1. (Original) A pressure sensor A characterized in that a piezoelectric element B in the form of a thin film and using a material which comprises a nitride or an oxide is formed on a base material C of an insulating material, and means D, E, F and G which transmit a signal from the piezoelectric element B are passed through the base materials to be taken out.
2. (Original) A pressure sensor A according to Claim 1 in which a pair of output electrodes D and E acting as the signal transmitting means are mounted on a side of the piezoelectric element B which is disposed toward the base material C.
3. (Original) A pressure sensor A according to Claim 1 in which the nitride comprises a thin film of aluminum nitride having a C-axis orientation.
4. (Original) A pressure sensor A according to Claim 1 in which the oxide is selected from a group comprising ZnO having a C-axis orientation, wurtzite compound of LiNbO_3 type, a single crystal of langasite ($\text{La}_3\text{Ga}_5\text{SiO}_{14}$), a quartz, PZT (lead zirconate titanate) and a perovskite type oxide.
5. (Original) A pressure sensor A according to Claim 1 characterized in that the surface of the thin film piezoelectric element B is covered by a protective film J.
6. (Original) A method of manufacturing a pressure sensor A including a piezoelectric element B formed of a nitride or an oxide as a material in the form of a thin film,

characterized in that the thin film piezoelectric element B is manufactured by one of a sputting, an ion plating, CVD, a laser ablation, an ion beam evaporation, a laser evaporation and a vacuum evaporation.

7. (Original) A structure for detecting a cylinder internal pressure of an internal combustion engine, characterized in that a piezoelectric element B of a pressure sensor A is disposed at a location which faces a combustion chamber h of an internal combustion engine.

8. (Original) A structure for detecting a cylinder internal pressure of an internal combustion engine according to Claim 7, characterized in that the piezoelectric element B comprises a nitride or an oxide in the form of a thin film.

9. (Original) A structure for detecting a cylinder internal pressure of an internal combustion engine according to Claim 7, characterized in that the piezoelectric element B is mounted on a wall surface of a cylinder head e of the internal combustion engine which faces a combustion chamber h with an insulating member C interposed therebetween.

10. (Original) A structure for detecting a cylinder internal pressure of an internal combustion engine according to Claim 9, characterized in that a pair of output electrodes D and E are mounted as signal transmitting means on a surface of the piezoelectric element B which is disposed toward the insulating member C.

11. (Original) A structure for detecting a cylinder internal pressure of an internal combustion engine according to Claim 9, characterized in that output electrodes D and E as signal transmitting means are mounted on the opposite surfaces of the piezoelectric element B.

12. (Currently Amended) A structure for detecting a cylinder internal pressure of an internal combustion engine according to Claim 10 ~~or 11~~, characterized in that output lead

wires F and G connected to the electrodes D and E, respectively, and acting as signal transmitting means extend through the insulating member C before they are taken out.

13. (Currently Amended) A structure for detecting a cylinder internal pressure of an internal combustion engine according to Claim 10~~-or 11~~, characterized in that the output lead wire G connected to one electrode E and acting as signal transmitting means extends through the insulating member C before it is taken out while the output lead wire F connected to the other electrode D is connected to a cylinder head e as the ground.

14. (Currently Amended) A structure for detecting a cylinder internal pressure of an internal combustion engine according to Claim 10~~-or 11~~, characterized in that a surface of the piezoelectric element B which is disposed toward the combustion chamber h is covered by a protective film J.

15. (Original) A structure for detecting a cylinder internal pressure of an internal combustion engine according to Claim 7, characterized in that the piezoelectric element B of the pressure sensor A is mounted on a portion of an auxiliary part of the internal combustion engine secured to a cylinder head e of the internal combustion engine which faces a combustion chamber h.

16. (Original) A structure for detecting a cylinder internal pressure of an internal combustion engine according to Claim 15, characterized in that the auxiliary part of the internal combustion engine is a glow plug K for an engine after-heat, the glow plug K including a heater L having an outer surface on which the piezoelectric element B is mounted through an insulator P interposed therebetween.

17. (Original) A structure for detecting a cylinder internal pressure of an internal combustion engine according to Claim 16, characterized in that the glow plug K includes a ceramics heater L have a heater coil Q embedded within a

ceramics insulator P, the piezoelectric element B being mounted on the outer surface of the ceramics insulator P, output electrodes D and E acting as signal transmitting means being mounted on a side of the piezoelectric element B which is disposed toward the ceramics insulator P.

18. (Original) A structure for detecting a cylinder internal pressure on an internal combustion engine according to Claim 16, characterized in that the glow plug K is constructed to include an insulating ceramics P held sandwiched intermediate conductive ceramics R, output electrodes D and E acting as the signal transmitting means being mounted on the outer surface of the conductive ceramics R through an interposed insulator S.

19. (Original) A structure for detecting a cylinder internal pressure of an internal combustion engine according to Claim 16, characterized in that the glow plug V includes a heater U of a metal sheath type, output electrodes D and E acting as signal transmitting means being mounted on the outer surface of the metal sheath Y through an interposed insulator Z.

20. (Original) A structure for detecting a cylinder internal pressure of an internal combustion engine according to Claim 15, characterized in that the auxiliary part of the internal combustion engine is an ignition spark plug 801.

21. (Original) A structure for detecting a cylinder internal pressure of an internal combustion engine according to Claim 15, characterized in that the auxiliary part of the internal combustion engine is a fuel injection nozzle 1001.